

Application No. 10/711,364
Technology Center 1775
Amendment dated September 21, 2006
Reply to Office Action dated June 21, 2006

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Amendments to the Specification:¹

Please replace paragraph [Para 6] with the following amended paragraph:

Commonly-assigned U.S. Patent No. 6,352,788 to Bruce teaches that YSZ containing about one up to less than six weight percent yttria in combination with magnesia and/or hafnia exhibits improved impact resistance. In addition, commonly-assigned U.S. Patent No. 7,060,365 Application Serial No. 10/063,962 to Bruce shows that small additions of lanthana, neodymia and/or tantalum to zirconia partially stabilized by about four weight percent yttria (4%YSZ) can improve the impact resistance of 4%YSZ. It would be desirable if further improvements in impact resistance could be obtained.

Please replace paragraph [Para 18] with the following amended paragraph:

The TBC can be formed of a variety of ceramic materials, a

¹ All references to pages and paragraphs in Applicant's electronically-filed application are those inserted by the USPTO authoring software.

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notable example of which is zirconia partially stabilized by yttria (e.g., about 4-8 wt.% YSZ). Other suitable ceramic materials for the TBC include materials formulated to have lower coefficients of thermal conductivity (low-k) than 7%YSZ, notable examples of which are disclosed in commonly-assigned U.S. Patent No. 6,586,115 to Rigney et al., U.S. Patent No. 6,686,060 to Bruce et al., U.S. Patent No. 7,060,365 ~~commonly-assigned U.S. Patent Application Serial Nos. 10/063,962~~ to Bruce, U.S. Patent No. 6,808,799 ~~10/064,785~~ to Darolia et al., and U.S. Patent No. 6,890,668 ~~10/064,939~~ to Bruce et al., and U.S. Patent No. 6,025,078 to Rickerby. Still other suitable ceramic materials for the TBC include those that resist spallation from contamination by compounds such as CMAS (a relatively low-melting eutectic of calcia, magnesia, alumina and silica). For example, the TBC can be formed of a material capable of interacting with molten CMAS to form a compound with a melting temperature that is significantly higher than CMAS, so that the reaction product of CMAS and the material does not melt and infiltrate the TBC. Examples of CMAS-resistant coatings include alumina, alumina-containing YSZ, and hafnia-based ceramics disclosed in commonly-assigned U.S. Patent Nos. 5,660,885, 5,683,825, 5,871,820, 5,914,189, 6,627,323.

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6,720,038, and 6,890,668, and 6,627,323 and commonly-assigned U.S. Patent Application Serial Nos. 10/064,939 and 10/073,564, whose disclosures regarding CMAS-resistant coating materials are incorporated herein by reference. Other potential ceramic materials for the TBC include those formulated to have erosion and/or impact resistance better than 7%YSZ. Examples of such materials include certain of the above-noted CMAS-resistant materials, particularly alumina as reported in U.S. Patent Nos. 5,683,825 and 6,720,038, No. 5,683,825 and U.S. Patent Application Serial No. 10/073,564. Other erosion and impact-resistant compositions include reduced-porosity YSZ as disclosed in commonly-assigned U.S. Patent No. 6,982,126 and U.S. Patent Application Serial No. Serial Nos. 10/707,197 and 10/708,020, fully stabilized zirconia (e.g., more than 17%YSZ) as disclosed in commonly-assigned U.S. Patent Application Serial No. 10/708,020, and chemically-modified zirconia-based ceramics. Finally, TBC's of particular interest to the present invention have a strain-tolerant microstructure of columnar grains. As known in the art, such columnar microstructures can be achieved by depositing the TBC using a physical vapor deposition technique, such as EBPVD or another atomic and molecular vapor process, as well as known

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melting and evaporation deposition processes. The TBC is deposited to a thickness that is sufficient to provide the required thermal protection for the component, generally on the order of about 75 to about 300 micrometers.